

#### AMENDMENT TO THE SPECIFICATION, 1.4.

##### **Device D. Multi knife cutting device, Inclined cutting action, Independent knife movement.**

This device is a larger version of device B ,planned for cutting whole potatoes into slices, which is not possible with the devices described earlier. This device can also cut potato slices into fingers and fingers into pieces without changing knives. This is ideal for cutting finger chips in addition to slicing and dicing of other vegetables like carrots, beetroot etc. This capability is achieved by employing bigger cross section knives , bigger guides and knives with independent handles so that they can be used in flexible combinations depending on the size of the vegetables.

The different views of the device are shown in figure nos.28,29,30,31,32.

Fig.no.28. Perspective view of the device from the front. Back side board not shown.

Fig.no.29. Front Elevation view. Front board not shown, to show other parts.

Fig.no.30. Cross section 1-1 of fig.29, Details of knife and guide mounting.

Fig.no.31. End view in direction A of fig 29 including boards.

Fig.no.32 End view of knife with handle.

##### **Part list**

Part no	Name	Quantity	Material	Dimension,mm
1	Knife	6	SS 420	48Wx1thx312L
2	Screws	4	Steel	
3	Knife handle	12	Laminate	2thx48x142 L
4	Fulcrum bolt	1	Steel	4 diax85L
5	Enclosure	....	.....	
6	Guides	7	Laminate	5x120Wx170H
7	Support	2	Wood	12thx68Hx160L
8	Spacer	6	Laminate	2x20x120L
9	Knife slot	6	.....	2 wide
10	Bolts,Frame	3	Steel	4diax85L
11	Support,Board	2	Wood	12x68x160
12	Board,left	1	Nylon	10x100x160L
13	Board,right	1	Nylon	10x100x160L
14	Washer,fulcrum	6	Laminate	1thx4idx20od
15	End stop	1	Wood	25Hx48Wx60L

### **Details of construction.**

As mentioned earlier this device is a larger version of Device B fig 22, with knives having independent handles. Here the knives are 48x1x312 long ( including handle) as compared to 24x1x160 long in device B. This increases the cutting capacity of the device.

The main parts are the slotted guide frame (parts 6,7,8,10)fig 29 , the assembly of six knives part 1,3,and the two boards parts 12,13,one on the left and second on the right as seen in fig 29. The guide frame consists of 7 guides part 6, with 6 spacers part 8 inserted between them at the bottom to create six slots of 2 mm width between them. The guides and the spacers are assembled together by adding two board supports part 7 and 3 bolts part 10.The orientation of the guides with respect to the base is as shown in fig 29. The guides are closed on the periphery to give it strength to guide the knives. There is an enclosure part 5 in the center for supporting vegetables.

Each knife is 312 mm long with one fulcrum hole of 4mm dia, 12mm from one end and two 4mm holes for fixing the handles at the other end. The knife has cutting edge of 170 mm and the rest 142mm is meant for attaching two nos 2mm thick laminate strips on either side to make the handle part 3. Six knives are inserted one into each slot in the slotted guide frame , so that the fulcrum hole of the knives matches with the hole in the frame for the fulcrum bolt. The fulcrum bolt is fitted , after inserting one washer part 14 for each knife. This connects all the knives to the guide frame. This feature is distinctive as normally knives are mounted on separate lugs on the base.

Then the two boards part 12, 13 are attached to the supports part 7 by using two screws part 2 each. Part 15 end stop for the knives is attached to the guide frame by part 10 as shown in fig 29. This completes the assembly.

If the assembly is correct the knives should move snugly in the slots, with the cutting edge towards the right hand side as seen in fig 29,where the knives are shown in vertical position. When the knives are vertical, the 60x75mm rectangular enclosure to the right is for placing the vegetables.

In fig 29 the horizontal position of the knives is shown in dotted lines to show the end position when they touch part 15, and stop before the cutting edge touches part 8 spacers. This is to prevent damage to the cutting edges at the end of the cutting stroke.

### **Working of the Device.**

As seen in fig 29 the knives should be in vertical position before the cutting starts.The enclosure next to the knives is for placing the vegetables to be cut on the bottom surface ,marked 5 on fig 29. Typically following quantities can be cut in one stroke with six knives simultaneously. The quantities are more here compared to

Device B as the knives here are 48x1mm as compared to 24x1mm.

Ten Okra or ten French beans, ten fingers of potatoes or carrot or similar volume of any other vegetable.

The device is six times more productive as in the same one stroke six cuts are made as compared to one cut by the single knife.

The device should be in front of the person cutting, with the knives vertical and facing the person. The vegetable should be placed inside the enclosure till the vegetables cover the full width of the guides, the balance length remaining on the board. The left hand is used to hold the device firm during cutting by mildly pressing down on the left board 12, away from the knives for safety. The right hand is used to bring down the knives part 1, holding all the individual handles together at the extreme end, all the way down up to the end stop, 15 in a circular arc. With this all the vegetables in the enclosure are cut clean and the knives are below them. There is no pressure on the cutting edges after the cutting, as the handles touch the end stop and there is a clearance below the knives proper.

Next, the cut vegetables are pushed on to the right board 13. Now the device is ready for the next cut.

The appearance of this device is very close to the cutting of vegetables with single knife and board, the only difference being six cuts are made instead of one, in one stroke of the hand, in the same time. The appearance is user friendly.

Other capabilities with the device are described now.

It can cut three 10 mm thick 50 mm dia slices of potato placed one on top of other, into 7 fingers in one stroke using all 6 knives. It can cut into fingers, four slices of potato of the same size as above, using the outer four knives first and the middle two knives soon after the first cut.

It can cut into fingers five slices of the same size potato, using two knives at a time, one after the other in quick succession.

It can cut a single potato 50 mm dia and 70 mm high into 7 slices by using two knives at a time in quick succession. This is the basic purpose for which the bigger knives have been provided.

This device is ideal for cutting finger chips.

#### **Distinctive features.**

This single device is capable of slicing whole potatoes, cutting slices into fingers, cutting fingers into small pieces, without changing any knives. It can also handle similarly Carrots, Beetroot etc. The device is certainly versatile.

The cleaning of the device is by water spray. Knives have long life and can easily be replaced. Safety is much better as there is no need to hold the vegetables by hand during cutting.

It can also be seen that the knives clear the platform part 5 where the vegetables are kept, at the end of the cutting stroke. This ensures that the cut pieces are not stuck between the knives, which is common with prior art.

The end stop for the knives ensures the knife edges are protected.

The guides part 6 fully guide the knives throughout the cut ensuring there is no misalignment of guides and knives, resulting in smooth cut.

The vegetable enclosure right next to knives and the long handles ensure mechanical advantage between 4 and 5.

The enclosure and guiding of the knives results in minimum bending of knives during cutting.

The mounting of knives directly on the guide frame makes the device compact and least likely to interfere with the extra length of the vegetable.

#### DEVICE D. MULTI KNIFE CUTTING DEVICE, INDEPENDENT KNIFE MOVEMENT.

Figure 20. Elevation view .Sheet no.10

Figure 21. Plan view. Sheet no 10

##### Construction details.

Part 1	Support	3x30x65 mm	st.steel
Part 2	bolt for knife assembly	6x90 mm	st.steel
Part 3	slotted platform	48x52x100 mm	Plastic
Part 4	Knife	1x25x160 mm	St.steel gr.420
Part 5	Support	20x30x75 mm	Plastic
Part 6	Knife handle	6x25x100 mm	Plastic
Part 7	Base board	20x75x270 mm	wood/plastic
Part 8	Spacer	6x8 mm	different lengths

The supports part 1 are screwed on to the board part 7 at one end as shown in fig 20.

The slotted platform part 3 containing 6 slots 3 mm wide is stuck to the base with adhesive at the location shown in fig 20. The six knives part 4 fitted with handles part 6, are fitted to the supports 1 using the bolt and spacers, part 2 and 8 so that the knives align with the slots in platform part 3. The support part 5 determines the position of the knife, leaving a clearance below and above the knife at the end of the stroke. Figure 21 shows how the knives match with the slots in the plan view.

##### Functional description.

The whole potato is placed on the platform 3 close to the raised edge at one end, with the knives part 4 in vertical position. Then the knives are brought down and touch the potato top. The center distance between the knives is 8mm. To cut the potato into slices the knives are brought down one by one, in quick succession into the slots. It is not advisable to bring down the knives simultaneously as the potato is large in size, which will cause the knives to bend sideways. This device is safer than single knife as the fingers are away from the knife. The device is also faster as all the knives are ready for cutting and there is no upward stroke for each knife cut as in the case of single knife. The slices are uniform giving better appearance.

This device can also be used for cutting of Okra, beans and slices of potato into small pieces by using all knives simultaneously. In this case the knives do not bend as the vegetable thickness is small compared to a whole potato. This device can be classified as multi purpose as the knives can be used separately or simultaneously depending on the thickness of the item being cut.